California's Path to 12,000 Megawatts of Local Renewables

Governor's Local Renewable Power Working Conference

State Goals Plenary Panel

Discussion Paper # 1

CHAIR ROBERT B. WEISENMILLER OF THE CALIFORNIA ENERGY COMMISSION

1. Introduction to Governor's Conference on Localized Electricity Generation
    a. California faces the twin challenges of climate change, and the great recession, which in combination represent significant challenges to our way of life. Innovative energy policy presents an opportunity to address both these challenges by transforming our electricity (and energy) supply system from one rooted in the 1950ties to one that reflects the needs of this century. Similar transformations will be required for the associated institutions including our regulators and utilities.
2. First, I'll address climate change, which requires Green House Gas (GHG) emissions reductions, primarily from fossil fuel combustion.
    a. Nunez's AB 32, the Global Warming Solutions Act, launched California towards an aggressive overall reduction of GHG by to 1990 levels by 2020 and the California Air Resources Board (CARB) has adopted a pioneering plan to meet this target.
    b. The electricity sector accounts for 23% and commercial and residential energy sectors accounts for an additional 9% of California's total GHG emissions, but these emissions levels will need to be cut by 30% from a Business as Usual case.[1] These savings will come from aggressive energy efficiency and renewable targets that call for decreasing emissions from the utility sector, despite increased demand due to large-scale transportation electrification.
    c. Achieving a further reduction goal of 80% of 1990 GHG emissions levels by 2050 will be even more challenging. Later this morning, Dan Kammen will provide some insights into this challenge, and may identify some potential solutions to achieve this 2050 target.

[1] ARB's Climate Change Scoping Plan, December 2008, http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf

   d. Perata's SB 1368 Emissions Performance Standards to reduce GHG emissions of long-term baseload (coal) power contracts to below 1,100 lbs CO2 per MWh.
      i. Later this morning Ron Nichols will discuss Los Angeles Department of Water and Power's (LADWP) efforts to comply with the legislation and AB 32.
      ii. We will hear how LADWP will replace their purchases from coal-fired power plants.

3. The ARB's Scoping Plan reflects the Loading Order which was a policy put forward by the California Public Utilities Commission (CPUC), the Energy Commission, and other state regulators to prioritize resources and help guide their decisions.
   a. Loading Order[2]
      i. First, maximize energy efficiency and demand response
      ii. Second, develop renewables and distributed generation (includes CHP)
      iii. Third, advance clean and efficient fossil-fired generation
      iv. Concurrently, improve transmission and distribution infrastructure
4. These policy preferences were first articulated in California during the first Brown administration in the late 1970ties in an era of Three Mile Island and the Iranian oil embargo.
   a. "Energy efficiency, which helped to flatten the state's per capita electricity use, will continue to be the keystone of California's energy strategy. California's building and appliance standards have saved consumers more than $56 billion in electricity and natural gas costs since 1978 and averted building 15 large power plants."[3]
5. To meet the aggressive goals in the Scoping Plan, the state agencies recognize that they needed to re-double their efforts to coordinate and improve communications. The CARB, CAISO, Energy Commission, CPUC, and CalEPA developed the California Clean Energy Future to compile existing policy goals and identify interdependencies in support of interagency planning and

[2] http://www.energy.ca.gov/energy_action_plan/index.html
[3] California Energy Efficiency Strategic Plan, January 2011 Update, Section 1 Page 2, http://www.cpuc.ca.gov/NR/rdonlyres/A54B59C2-D571-440D-9477-3363726F573A/0/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf

management. [4] Currently, the agencies are developing metrics to transparently track progress towards energy policy goals and to help identify any needed course corrections.

6. With energy efficiency first in the loading order, CEC and CPUC continue to implement California's Big Bold Energy Efficiency plan, and starting in the 4th quarter of 2010 the CEC has already conducted 10 staff workshops on Draft Residential and Nonresidential Buildings for Possible Inclusion in the 2013 Building Efficiency Standards during the Pre-Rulemaking. [5]
    a. I expect Jeanne Clinton will provide some information on the CPUC's energy efficiency and renewable programs, particularly those aimed at localized electricity generation.
7. Also, the legislature has enacted several major energy efficiency initiatives in recent years which the Energy Commission and CPUC are also implementing.
    a. AB 758 (Skinner), Chapter 470, Statutes of 2009 - Energy: energy audit[6]
        i. Requires the Energy Commission to develop and implement a comprehensive program to achieve greater energy savings in the state of California's existing residential and nonresidential building stock.
        ii. The AB 758 program will be conducted in 3 phases which include development of the workforce and industry infrastructure and the AB 758 Implementation Plan (2010-2012); transformation of the energy assessment, retrofit and finance markets (2012 – 2014); and development of requirements for energy ratings and upgrades (2014-2015 and beyond).
    b. SB 77 (Pavley), Chapter 15, Statutes of 2010 Energy: Property Assessed Clean Energy (PACE) Financing
        i. Established a Property Assessed Clean Energy (PACE) Reserve Program, funded with $50 million from the Renewable Resource Trust Fund, to help finance efficiency and clean energy projects permanently affixed to real property.

[4] http://www.cacleanenergyfuture.org/
[5] http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/
[6] Energy Commission website on AB 758 http://www.energy.ca.gov/ab758/

1. However, Fanny Mae and Freddy Mac prevented PACE from being implemented.

ii. SB 77 will be affected by SB 679 and AB X1 14 that have not yet passed. SB 679 gives $25 million to ECAA, and AB X1 14 gives $25 million to CAEATFA for a new loan program.

c. AB 262 (Bass), Chapter 227, Statutes of 2009 - American Recovery and Reinvestment Plan: energy activities, programs, or projects
   i. Appropriated $113 million of ARRA funds for EE projects.

d. After efficiency, the loading order identifies the need for renewables to meet electricity demand. This spring, Senator Simitian authored a bill (SB X 1 2 (Chapter1, Statutes of 2011-12)) to greatly increase the renewable portfolio standard 20% by 2010 to 33% by 2020, and established policy preferences among some of the renewable resources.

e. Interim targets
   i. 20% on average for the compliance period of 1/1/2011 to 12/31/2013
   ii. 25% by 12/31/2016
   iii. 33% by 12/31/2020 and each year thereafter

f. Amount that must be interconnected to California grid
   i. At least 50% for 2011-2013 compliance period
   ii. At least 65% for the 2014-2016 compliance period
   iii. At least 75% thereafter

g. Tradable RECs limits
   i. Not more than 25% for the 2011-2013 compliance period
   ii. Not more than 15% for the 2014-2016 compliance period
   iii. Not more than 10% thereafter

8. California has the potential to develop renewable energy systems on state owned buildings, properties, and rights-of-way to help meet the state's renewable energy goals, create green jobs, and reduce greenhouse gas emissions and other harmful air pollutants.

   a. Making state properties available to renewable developers could reduce existing energy costs in state buildings, create new revenue streams by leasing vacant or unused lands and rights-of-way, and realize cost savings by eliminating the obligation to maintain lands leased to developers.

   b. Further, state leadership will demonstrate the benefits of distributed generation (DG), potentially reduce the need for new or upgraded transmission lines, and help spur larger-scale deployment throughout the state and across the country.
   c. California state government should target installing 2,500 megawatts of renewables on state properties to help meet the overall 20,000 megawatt statewide goal as well as help contribute to the 33% RPS.

9. Second, California's other change is the economy and the needs for more high quality jobs. We need to do better. Conveniently there was a major study on this topic last week.
   a. Brookings Report[7]
      i. California Ranks 1st among the 50 states and DC with over 315,000 clean jobs.
      ii. Clean economy jobs make up over 2% of all jobs in the state.
      iii. California's clean economy jobs increased by over 4% annually between 2003 – 2010.
      iv. "Cleantech" segments produced explosive job gains and the clean economy outperformed the nation during the recession.
      v. 2.7 million people held 'clean economy' jobs in 2010, which is 300,000 more than fossil fuel associated jobs.
   b. Clean economy jobs compared to fossil fuels associated jobs - $1 invested in renewable energy or energy efficiency will yield up to four times as many jobs as $1 invested in oil and gas.[8]
10. Governor Brown has proposed an aggressive jobs plan as the foundation of his energy policy. CLEAN ENERGY JOBS PROGRAM[9]
   a. Governor Brown has stated the "33% is floor, not a ceiling."
   b. 12,000 MW of localized electricity generation (Renewable)
      i. Supply Side – Procurement methods
      ii. Customer side – Procurement methods
      iii. Scenario Planning – Regional targets

[7] http://www.brookings.edu/reports/2011/0713_clean_economy.aspx
[8] Dr. Robert Pollin, Green Investments and Jobs: A Response to the Heritage Foundation, November 7, 2008, Center for American Progress.
[9] http://www.jerrybrown.org/Clean_Energy

c. 8,000 MW of Large Scale Renewables and Necessary Transmission Lines (Will need to build new transmission and need to cut permitting to 3 years)
d. Peak load management and energy storage (5% of utilities' peak loads)
e. Zero Net Energy New Homes by 2020 and Commercial Buildings by 2030
    i. Big Bold EE Plan states: "Codes and Standards require zero net residential buildings by 2020… coordinate development of codes and standards with state and voluntary programs such as Energy Star, LEED, Flex Your Power, etc."
f. Stronger Appliance Efficiency Standards (such as plug loads – ie battery chargers[10])
g. Increase CHP by 6,500 MW

11. Laura Wisland will discuss some of the benefits of the localized electricity generation goals of the Governor.
12. Policy Challenge
    a. This conference is about meeting the Governor's goal of 12,000 MW of localized electricity generation. As I have discussed above, California has a rich range of sustainable energy options, and this specific goal will both compliment and extend the existing policy context. Obviously, there are a variety of ways to achieve this goal and today I want to begin the discussion of some of the trade-offs.
    b. As we work our way through some of the competing approaches, it is useful to start with the overall policy constraints of safe and reliable power.
        i. Steve Berberich and to some extent Ron Nichols will address these potential objectives, although Steve's operational responsibilities are the transmission system as opposed to the distribution system.
    c. There are a number of policy drivers that may influence how we approach implementing the Governor's goal, so let's start talking about the tradeoffs. As we consider different technologies or mixes of capacity, different locations, different financing approaches, different regulatory policies, different rollout schedules…

[10] http://www.energy.ca.gov/appliances/battery_chargers/index.html

i. What are the implications in terms of jobs, GHG reductions, equity and environmental justice implications, costs, environmental costs and benefits, reliability, business development, or strategic value of these resources, etc?
    1. For example, are there approaches to localized electricity generation that would maximize coal displacement? Or provide a backup plan for the relicensing of our nuclear assets? Or complement the electrification of our transportation system?

d. How can we maximize the reliability benefit of these projects and/or reduce interconnection costs?
e. How can we minimize costs of this program in terms of timing or project size or program design? Are we approaching grid parity for localized electricity generation, and if so what should our rollout over time be?
f. How can we maximize jobs and business development with this program?
g. How can we minimize environmental costs and maximize environmental benefits? What are the best practices in terms of project designs and siting considerations?
h. How can we design the program to address equity concerns, particularly environmental justice issues?
i. Are there any fundamental technical problems that must be addressed by requiring specific standards for these facilities?
j. Are there basic consumer protection requirements that must be established for these facilities?
k. What is the tradeoff between locating projects in our urban areas as opposed to distressed land outside the load center?

13. I look forward to an interesting two days and to the overall roadmap that emerges. There is much to do but we can work together to rebuild our energy system and address the challenges of both climate change and our economy.

STEVE BERBERICH, CHIEF EXECUTIVE OFFICE FOR CALIFORNIA INDEPENDENT SYSTEM OPERATOR

1. Introduction to the ISO

a. System operator for 80% of CA, which does not including the Los Angeles Department of Water and Power or SMUD
b. Planning authority for our area and responsible for the reliable interconnection of generation to the ISO-controlled grid.
c. No distribution system responsibilities, but committed to providing expertise and experience to inform California policy and program development.

2. Reliability Considerations
    a. Must balance demand and generation within a tight band every four seconds.
    b. Reasonable level of confidence about demand forecasts based on what we have seen under a variety of conditions over many years.
    c. Much less confidence about performance of solar and wind generation that changes with weather conditions
    d. These issues have our full attention. We will be ready.
3. Two areas of focus.
    a. Forecasting: Critically important.
        i. New operating center includes the first renewable desk in North America with state-of-the art real time displays of solar and wind output and changing weather and system conditions.
        ii. Pilots underway to improve our ability to anticipate weather changes that will affect electric generation. Will directly benefit our ability to forecast changes in output from distributed generation, provided we have visibility to its location and size.
        iii. Visibility:
        iv. ISO has visibility (telemetry) to 88% of the 58,000 MW of generation interconnected with the ISO grid and requires visibility to all new interconnections.
        v. ISO has no visibility to what is installed on the distribution system. Manageable at the level of distribution that exists today but not at the 12,000 MW level proposed.
        vi. Working with the state's utilities to ensure that we have the right communications in place on the distribution system to inform our operations.

4. Interconnection Considerations
    a. A disciplined engineering study process defines what facilities a new powerplant must install to reliably interconnect to the transmission system. If a generator wants to be counted toward meeting state resource adequacy requirements, additional studies are necessary to determine whether other upgrades are necessary to make the plant's output deliverable to consumers under peak load conditions.
    b. California's renewable portfolio standard has resulted in very large amounts of generation proposing to interconnect with the transmission system.
        i. Over 70,000 MW of renewable generation proposing to interconnect with our balancing area, which has an all-time peak load of about 52,000 MW.
        ii. Two years ago, implemented a new process to study projects in clusters defined by where they propose to interconnect with the transmission system.
            1. Previously projects were studied one at a time in the order they applied. If a project dropped out, it changed the engineering of all those that had been studied assuming it was in.
            2. Process changed to (1) study them in electrically related groups called clusters and (2) increase deposit requirements to reflect cost obligations.
            3. Still receiving more projects than the system can absorb. Considering further changes to (1) study what the system can carry and (2) assess means to weed out projects with interconnection agreements that are not meeting project milestones.
5. We have learned
    a. Location matters. Interconnection costs for the transmission system can range from as low as a few million of dollars to hundreds of millions of dollars depending on the facilities needed to interconnect and whether network upgrades are necessary to ensure the output is deliverable under system peak conditions.

   b. Project viability matters.
   c. Local power quality matters.
6. Conclusion -- Here as part of our commitment to providing our expertise and experience to help inform California policy and program development.

RON NICHOLS, GENERAL MANAGER OF THE LOS ANGELES DEPARTMENT OF WATER AND POWER

1. LADWP's plans to meet 33% by 2020 and how local, distributed generation (solar and energy efficiency) fits into that
2. The concurrent challenges of moving off of coal
3. Other reliability investments required of a 100 yr old system
4. Other issues unique to DWP in our power supply - Once Through Cooling
5. Challenges of the retail rate effects of all of the above
6. What this means for additional notions of further expanded DG

JEANNE CLINTON OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION

1. CPUC Jurisdiction and Role:
   a. IOUs procure & deliver ~70% electricity and > 95% natural gas in CA
   b. CPUC to balance how utilities deploy ratepayer funds to meet demand, safely and reliably, at lowest possible cost -- while meeting State's policy goals for energy loading order, renewables, and GHG reduction
2. CPUC policies and regulations seek to enable 2 forms of DG (supply-side and customer-generation), each with own procurement mechanisms or investment promotion techniques, and different "buyers"
   a. Review procurement mechanisms, seeking > 5200 MW near-term via IOU service areas (see 2 slides)
   b. Key differences between "Customer Side" and Utility System Side:
      i. Customer Side: small projects < 5 MW (mostly < 2 MW, sized to meet site's energy needs, system owned individually, output reduces demand forecast (to which CAISO and utilities plan resource needs)

   ii. Utility-Side: any size project, paid for output via contract (no rebates or incentives), Sized for expert, Counts toward Procurement and Resource Adequacy

c. What are we expecting?
   i. Utility-Side (Wholesale) DG Contracts last year were many small 1-2 MW projects, and half as many large 15-20 MW projects
   ii. New mechanisms starting up:
      1. Renewable Auction Mechanism (Interim goal of 1000 MW in first 2 year from projects up to 20 MW, priced via reverse auction where lowest bids accepted)
      2. Feed in Tariff (for small projects now up to 1.5 MW, to expand to 3 MW. Target of 750 MW to be bought at specified price.) Primary technologies are biogas, small hydro, and solar PV.
   iii. CSI - CA today has 900+ MW installed as CG at 94,000+ locations (see slide)
      1. Program emphasizes statewide technical and sizing guidelines, warranties, quality equipment certification. Incentives focus on performance.
      2. Recent changes to expand VNM, RES-BCT to offer more flexibility on sizing a system relative to crediting power production to customer's nearby sites.
   iv. SGIP – Recent years focused on wind and fuel cells, with total of 125 MW of renewable projects apart from solar PV. Proposed decision out for comment to expand technology participation, promote in-state biogas use, allow larger systems, and re-focus on performance.

3. These resources must fit into long term procurement planning, and meet California's procurement policies and principles
   a. Policies: Loading order, renewables, GHG, resource adequacy
      i. Value resources for their avoided costs – some avoiding generation, transmission and some distribution when placed closer to load centers, others sited away from load avoiding generation and some transmission

   ii. Scenario planning for costs/benefits of resources, locations, and availability
b. Principles:
   i. Identify least-cost viable projects that can interconnect quickly
   ii. Create a sustainable and long-term market for renewable DG projects
   iii. Provide sufficient payment to simulate untapped market segments at the distribution level while preserving competition
   iv. Minimize the transaction costs for the seller, buyer, and the regulator
   v. Equitably allocate risk between the buyer and the seller
   vi. Adequately address project viability
c. Grid integration issues:
   i. Key for DG is to identify optimal locations on grid to maximize avoided costs and also minimize grid integration costs
      1. Grid mapping data key to allow project developers to identify good sites to interconnect and help lower development costs
   ii. Utilities must provide capacity at the substation and circuit level for their distribution systems
      1. As we see DG saturation increase, will need to pay more attention to distribution system capacity, and ability to handle DG exports

4. Integrated Demand-Side management – coordinating renewable DG with EE and DR policies
   a. Zero Net Energy buildings (pilots, emerging technology, R&D for BIPV, vision for future building markets)
   b. Codes & Standards -- solar PV and water heating, building controls and smart meters, in codes & standards as market transformation strategy (CEC authority, CPUC supports via utility pilots, early incentives, analysis)
   c. Via diagnostic/advice tools, smart meters, smart building/ appliance telemetry
5. Market adoption issues

a. Utility-side DG has long-term contracts for renewable production sold into wholesale market.
b. Customer generation competes at retail prices, but owners/investors have shorter horizons For Customer Generation, market transformation strategies now being propagated to increase the value proposition and market penetration via:
    i. increased technology performance;
    ii. scale economies to drive down unit price;
    iii. PPAs and leasing arrangements to surmount capital hurdle and match cash flow.

LAURA WISLAND OF UNION OF CONCERNED SCIENTISTS

1. Why should the state dramatically shift from fossil fueled-electricity and towards renewables?
    a. We are experiencing the downsides of fossil fuel use like never before:
        i. Air and water quality related health problems and their costs to California
        ii. Threat of global warming and the dangers it poses to our water supply, levee systems, agricultural productivity, public health
        iii. Growing concern about the cost, availability, and environmental impact of extracting fossil fuels. For nuclear, safety is also a factor, given what we just witnessed in Japan.
    b. Clean sources of electricity like the sun are ubiquitous and plentiful.
    c. Dramatically shifting our electricity sector away from fossil fuels is not something we can accomplish by snapping our fingers, but we are pushing the boundaries of what we thought was possible on things like oil drilling and natural gas extraction- we should be doing the same for power that we know is clean and limitless.
    d. Clean energy has already provided economic benefits to California
2. The environmental/social/economic benefits of renewable DG
    a. Benefits include:

   i. Avoided fossil generation from existing facilities, especially during peak times. This results in fuel cost savings, less emissions and less reliance on natural gas volatility
   ii. Help defer the need to build more fossil generators- reduced air/land/water impacts
   iii. Help defer transmission or distribution upgrades or new construction.
   iv. Fewer transmission line losses
   v. Fewer potential environmental impacts. This results in fewer mitigation hurdles to overcome. Projects are less likely to use virgin land and can make use of existing infrastructure like rooftops and parking lots, and open space that has minimal use (like brownfields)
   vi. Less strain on water resources
   vii. Local economic development (green jobs where people live)
   viii. Increased consumer autonomy
- b. So far, DG is an underutilized renewable energy resource in CA (provide evidence) and analysis shows that California's distribution grid can accommodate a much larger amount of DG resources.
- c. We have policies in place to encourage in DG, but they are currently modest in scope
- d. Statewide efforts should focus on reducing market barriers, increasing efficiencies with permitting and citing, providing incentives to develop projects in the locations that provide maximum value to the grid and community, and reducing interconnection challenges.
- e. Need to take a long-view on clean energy development, think beyond 2020. Creating a more robust infrastructure for DG in California is in line with the goals of the RPS, but the RPS does not guarantee we will get 12 GW of DG and may act as a ceiling unless we are careful.

3. Strategies to maximize renewable DG
   a. Important to maximize co-benefits and respect the loading order. DG should be developed alongside cost-effective EE and DR
   b. Invest in a more responsive, flexible grid that will support increasing levels of clean and local electricity generation.

c. Potential generators need to be able to see the distribution circuit and minimum loads, so that they have as much info as possible to locate their generation units in the places with the greatest need, in order to maximize benefit to the system.
d. In the bigger picture, don't treat California as an electricity island. We will benefit as a state and as ratepayers if we developing ways to share electricity with neighboring balancing authorities and system operators.

DAN KAMMEN, CHIEF TECHNICAL SPECIALIST, RENEWABLE ENERGY AND ENERGY EFFICIENCY OF WORLD BANK

1. GHG emission reductions via an RPS and price on carbon.
2. Building Energy and Service Opportunities into a Smart Home.
3. Cool California.org – Provides resources to all Californians in order to reduce their environmental impact and take action to stop climate changes.